Teleconnect
Verbindungen in die Zukunft

SOCRATES EVB

Quick Start Guide

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Revision History:

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Revision	Date	Comment
1.0.0	7-Jan-15	Internal release
1.0.1	21-Jan-15	Reviewed document
1.2.1	20-Apr-15	Release for software revision V1.2

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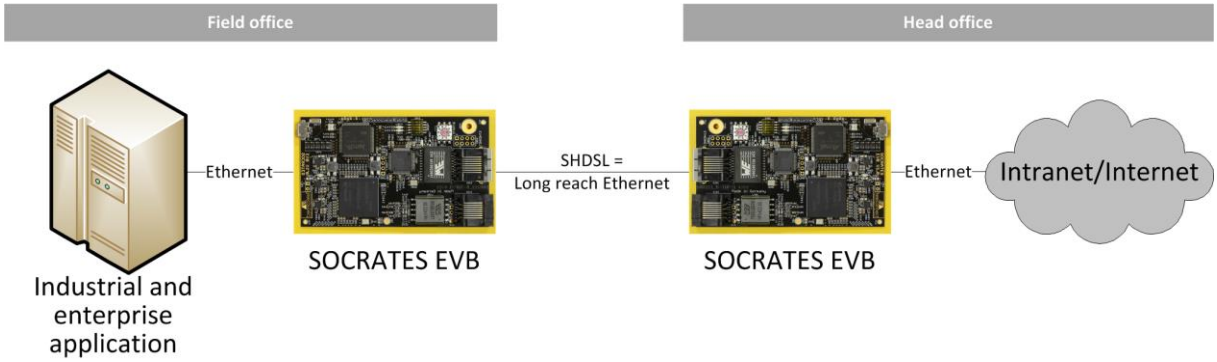
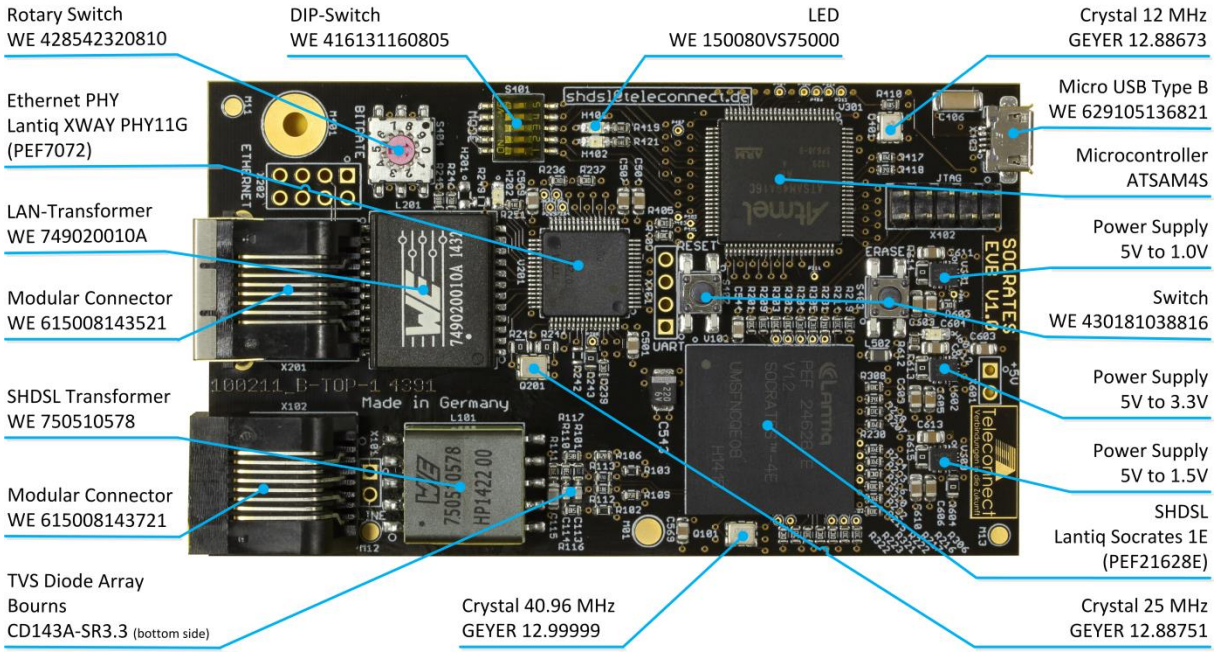
1 Introduction

The new SOCRATES EVB 1.0 Reference Design targeting industrial designs enables new customers to take advantage of Lantiq SHDSL for long reach broadband connectivity. It's the first ever ready-to-copy reference design developed for the Lantiq SOCRATES Chip. The SHDSL/Ethernet Bridge Modem was developed by Teleconnect and measures only about 9 x 5 cm and is available for online purchase through the Würth Midcom Website (http://www.we-online.com/socratesdemo). Teleconnect offers dedicated support for board and software customizations. With this, for the first time ever even smaller companies without DSL expertise can include SHDSL and Long-Reach-Ethernet connectivity into their designs.
SHDSLs unique rate/reach performance makes it the product of choice in an ever more diversified field of applications ranging from business broadband access, to enterprise networks and industrial communications.
Known as long haul Ethernet, SHDSL was included in the Ethernet standard IEEE 802.3-2008, where it is named 2BASE-TL. Standard Ethernet has a maximum reach of 100 m. SHDSL has a reach beyond 15 kilometres.
Using SHDSL makes it possible to Transmit Ethernet over only one unshielded twisted wire pair or over any other cable.



2 Component Overview

The following picture shows the top side of SOCRATES EVB. The most important components are described in this chapter.



Please download the latest version of the bill of material. It is recommended to use the listed components.

2.1 SHDSL chip SOCRATES-1e PEF21628E

SOCRATES is the world's leading SHDSL solution. For more information about Lantiq Semiconductor see http://www.lantiq.com/ and about SHDSL see https://www.lantiq.com/shdsl.
Please register at http://www.lantiq.com/ for data sheets.
It is also possible to use the pin compatible 2 or 4 channel chips PEF22628E and PEF24628E. However, SOCRATES EVB provides only one usable channel.

2.2 Würth Elektronik (WE)

For more information about Würth Elektronik GmbH & Co. KG please look at http://www.we-online.com.
The largest number of components used at SOCRATES EVB comes from WE. The picture shows only the main components. There are a lot of further components besides those depicted. Please also look at SOCRATES EVB bill of material.

2.3 Bourns

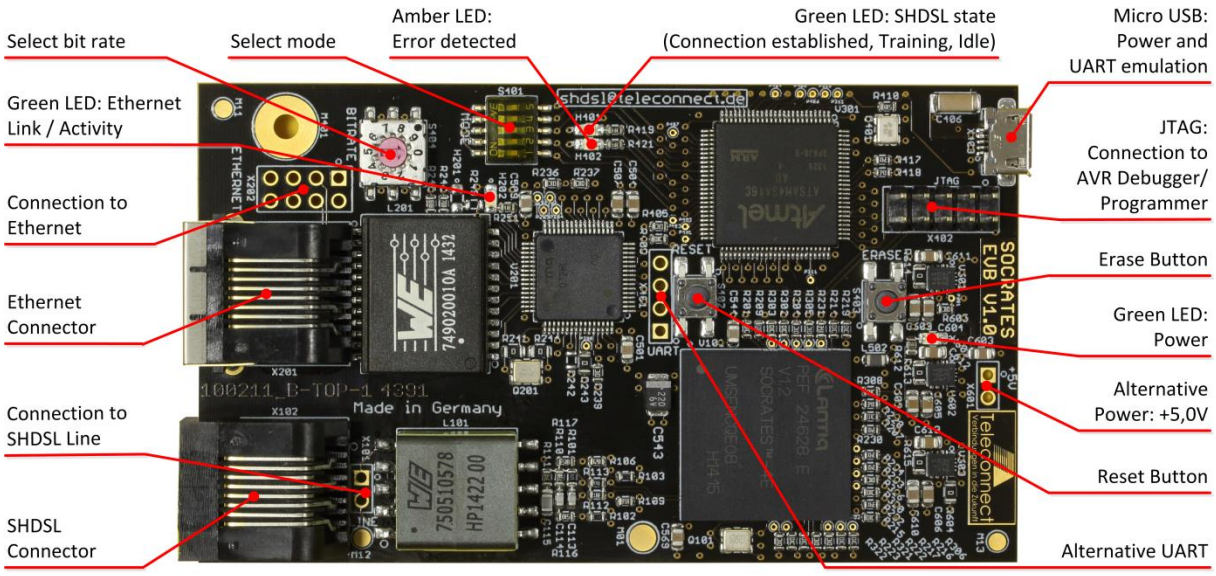
For more information about Bourns, Inc., please look at http://www.bourns.com/.
Bourns is a leading supplier of SHDSL protection solutions.

2.4 GEYER

Further information about GEYER ELECTRONIC e.K. are given at http://www.geyer-electronic.com/.
The Crystal 40.96MHz is a special development for the SOCRATES chip.

3 Functional description

The following picture shows the control and operating elements. The SOCRATES EVB is designed to work autonomously without using external software. Just plug and play!



3.1 SHDSL Connector

The unshielded RJ45 connector is used for connecting the SOCRATES EVB to one SHDSL line (according to ITU-T G.991.2) using Pin 4 and 5. The other pins are not connected.
A standard Ethernet cable is also usable.
Beside the RJ45 connector SOCRATES EVB provides the possibility to use a pin header.

3.2 Ethernet Connector

The shielded RJ45 is a standard Ethernet interface. It is compatible to 10BASE-T and 100BASE-TX Ethernet according to IEEE 802.3.
Besides the RJ45 connector SOCRATES EVB provides the possibility to use a pin header.

3.3 Micro USB

The main function of the Micro USB Connector is the power supply. Connect to USB plug-in power supply (5 V) or any self-powered USB host interface.
The Micro USB Connector can also be used as a management interface using UART emulation.

3.4 Reset Button

Pressing this button triggers hardware reset of processor and SHDSL interface.

3.5 Erase Button

There are two functions: Pressing the Erase Buttton during reset (Reset button is also pressed) will be cleared the whole flash memory. This is necessary to reload a new Firmware version via processors SAM-BA interface.
During runtime additional information about software and line state will be printed to the serial interface (UART) if the button is pressed.

3.6 Select Mode

The DIP switch is used for selection of operation mode. The selection will be sampled once after reset. Please use also the reset button after changing the operation mode.
There are 5 DIP switches available. The following table describes the functions.

Switch number	Description	Switch function
1	Device Mode	On: STU-C (Master, CO mode) Off: STU-R (Slave, CPE mode)
2	Extended Rates	On: Extended bit rates Off: ITU-T standard bit rates
3	Reserve	Reserved for future use
4	Test mode (TM1)	Both off: no test mode (normal function) TM1 on, TM2 off: PSD test TM1 off, TM2 on: idle (Silent State) Both on: Loopback
5	Test mode (TM2)	

Please note that you have to remove protective tab on top of DIP switch before first use.

3.7 Select bit rate

The rotary switch is used for selection of the bit rates. The selection will be sampled once after reset. Please use also the reset button after changing the bit rate.
The target SNR margin is set to 6 dB.

Switch position	Extended Rates (DIP switch 2)	Lineprobing	Bitrate [kbit/s]	PAM
0 (default)	Off	Enabled	192…5686	Auto
1	Off	Disabled	192	16
2	Off	Disabled	384	16
3	Off	Disabled	512	16
4	Off	Disabled	768	16
5	Off	Disabled	1536	16
6	Off	Disabled	2048	16
7	Off	Disabled	2304	32
8	Off	Disabled	3072	32
9	Off	Disabled	5696	32
0	On	Enabled	64…15296	Auto
1	On	Disabled	64	4
2	On	Disabled	192	4
3	On	Disabled	192	8
4	On	Disabled	2496	4
5	On	Disabled	5056	8
6	On	Disabled	7616	16
7	On	Disabled	10176	32
8	On	Disabled	12736	64
9	On	Disabled	15296	128

3.8 LEDs

3.8.1 Power (green)

Off: SOCRATES EVB not powered up
On: Power supply ok, the board is active

3.8.2 SHDSL state (green)

Off: SHDSL not active
Slow blinking: SHDSL is ready (SOCRATES is initialized)
Fast blinking: SHDSL training phase
On: SHDSL connection is established

3.8.3 Ethernet Link/Activity (green)

Off: no Ethernet connection
On: Ethernet link detected
Blinking: Ethernet connection with data traffic

3.8.4 Error (Amber)

Off: The board is working without any failure
On/blinking: An error has occurred

4 Start-up guide

The following description provides an easy way to establish a data connection using SHDSL. You need at least one SOCRATES EVB and one any other standard conform SHDSL modem.
However, the easiest way to make a SHDSL connection is to use two SOCRATES EVB.

4.1 Realize the Long-Reach-Ethernet Connectivity

- Check your existing application (infotainment systems, video surveillance, vending machines, traffic control, emergency communication, sense and control …) for an existing Ethernet interface.
- Connect Ethernet interface to SOCRATES EVB.
- Connect 5 V power supply to the Micro USB connector.
- Connect SHDSL lines.
- Select bit rate and operation mode (e.g. master mode (STU-C) or slave mode (STU-R)).

4.2 Start-up with two boards

1. Verify default settings: all DIP switches off, rotary switch on 0.
2. Switch on Device Mode (DIP switch 1) for Master (STU-C) at one board.
3. Connect both SHDSL connectors together. You can use a standard Ethernet patch cable.
4. Power up both boards. E.g. connect the micro USB plug to PC.
   - The power LED, Error LED and the SHDSL LED go on.
   - After some seconds the amber Error LED goes off. The SHDSL LED starts blinking slowly.
   - The SHDSL LED blinks fast during SHDSL Training.
   - The SHDSL LED is on if the SHDSL connection is established.
5. Disconnect the Ethernet cable from your computer; plug it into the Ethernet connector of the first board. Connect the wall outlet to the Ethernet connector of the second board.
   - The Ethernet LED is on for established Ethernet connection.
   - The Ethernet LED starts blinking for Ethernet traffic.
6. Ready! You are using SHDSL for your data connection.